



AquaSol

Unvented Solar Hot Water System



Installation & User Manual

THIS MANUAL IS TO BE LEFT WITH THE HOUSEHOLDER
AFTER INSTALLATION

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1. General instructions

This device must only be used for the purpose for which it is specially designed. This unit is designed to heat water to a temperature below boiling point and must be connected to a heating system and/or a water supply system for domestic use, compatible with its performance, characteristics and its heating capacity. Any other use is considered improper.

AQUASOL INSTALLATION MUST ONLY BE PERFORMED BY QUALIFIED PERSONNEL, IN ACCORDANCE WITH ALL THE INSTRUCTIONS GIVEN IN THIS TECHNICAL MANUAL, THE PROVISIONS OF CURRENT LAW, THE RECOMENDATION OF BS STANDARDS, ANY LOCAL REGULATIONS AND THE RULES OF COMPETENT WORKMANSHIP.

Incorrect installation can cause damage or physical injury for which the manufacturer declines any responsibility.

This appliance must be installed strictly in accordance with the following instructions and regulations:

The Local Building Regulations.
The Building Regulations (Part L).
The Building Regulations for Discharge Pipes
The Buildings Standards (Scotland - Consolidated) Regulations.

British Standards Codes of Practice:

- B.S. 5449 FORCED CIRCULATION HOT WATER SYSTEMS
- B.S. 7671 IEE WIRING REGULATIONS
- B.S. 4814 SPECIFICATION FOR EXPANSION VESSELS
- B.S. 7593 TREATMENT OF WATER IN DOMESTIC HOT WATER CENTRAL HEATING SYSTEMS
- B.S. 5546 INSTALLATION OF HOT WATER SUPPLIES FOR DOMESTIC PURPOSES
- B.S. 7431 1991 - METHOD FOR ASSESSING SOLAR WATER HEATERS – ELASTOMETRIC MATERIALS FOR ABSORBERS, CONNECTING PIPES & FITTINGS.
- B.S. 7206 1990 – (Incorporating amendment No1) UNVENTED HOT WATER STORAGE UNITS & PACKAGES.

Model Water Bye Laws

B.S. 5955-8 PLASTIC PIPEWORK INSTALLATION

For Northern Ireland the rules in force apply

2. Technical Specifications

Manufactured by: ZEN-International/Itho dedicated for:

Ferrolì Ltd.
Lichfield Road
Branston Industrial Estate
Burton-Upon-Trent
Staffordshire
United Kingdom
DE14 3HD

Guarantee period 1 year

Specifications:	Maximum mains supply pressure	10 Bar
	Minimum mains supply pressure	1.5 Bar
	Unit operating pressure	3.5 Bar
	Unit test pressure	13 Bar
	Expansion vessel charge pressure	3.5 Bar
	Expansion valve setting	6.0 Bar
	Pressure and temperature relief valve	
	Opening pressure	7.0 Bar
	Opening temperature	95°C
	Cold water connection	15 mm
	Hot water connection	15 mm
	Unit Measurements	H930 x W510 x D510 mm
	Storage capacity	75 litres
	Mass of empty unit	31 kg
	Mass of filled unit	118 kg
	Maximum primary working pressure	2.5 Bar
	Collector Flow connection	10 mm
	Collector Return connection	15 mm

3. System requirements

For correct operation the AquaSol must only be installed in conjunction with:

- Ferrolì combination boilers capable of receiving pre-heated water and which incorporate a heat exchanger in which the domestic hot water is maintained at a minimum temperature of 60°C at all times.
- Ferrolì solar collectors suitable to be used in a drain-back system. Advised is one Ferrolì Compact 23 collector.

4. Component Checklist

Before beginning the installation of this unit examine the contents, and determine that all the components listed below are included:

- 1 Ferrolì AquaSol unit (comprising: 1 Pump, 1 Filling/circulating manifold with pressure relief valve).
- 1 Cold water inlet kit (comprising: 1 x 3.5 bar rated pressure reducing valve, 1 x combined expansion relief / check valve, 1 x 12 litre expansion vessel*). *Packed separately.
- 1 Tundish.
- 1 Thermostatic Mixing Valve
- 1 Water flow limiter valve assembly c/w removable flow limiter.

5. Handling the Unit

The unit should be handled with care, stored in dry conditions and not stacked more than 3 units high. Always store the unit in the indicated upright position.

Do not rest the packed or unpacked unit on its lower side as this will damage the inlet system.

Do not handle the unit using any of the pipe work or fittings.

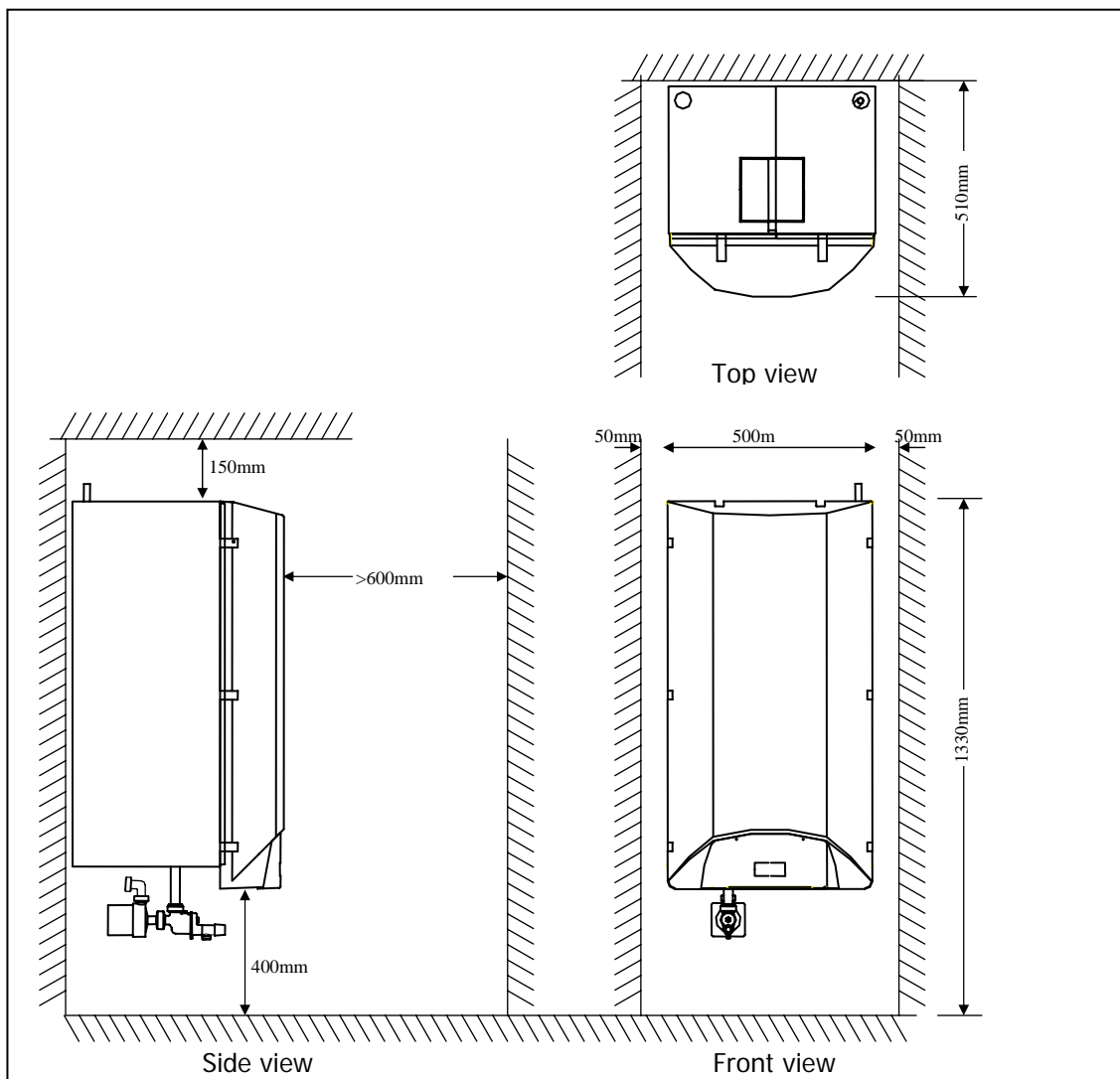
6. Positioning and Mounting the Unit

6.1 Locating the Unit

When locating the unit consideration should be given to the following:

- Access to the cold water mains inlet pipe work
- Access to the hot water pipe work
- Access to a 230v a/c electrical 3amp switched fused spur
- Access to waste water system (see paragraph 7.9)
- Suitability of the wall to support the unit (see paragraph 6.2)

The following clearances are required for maintenance purposes:



6.2 Mounting Requirements

The unit has a total filled weight of 118 kg, and as such provision must be made for the mounting wall to accommodate this weight via the wall mounting points. Use the fixings supplied.

6.3 Positioning and Mounting the System

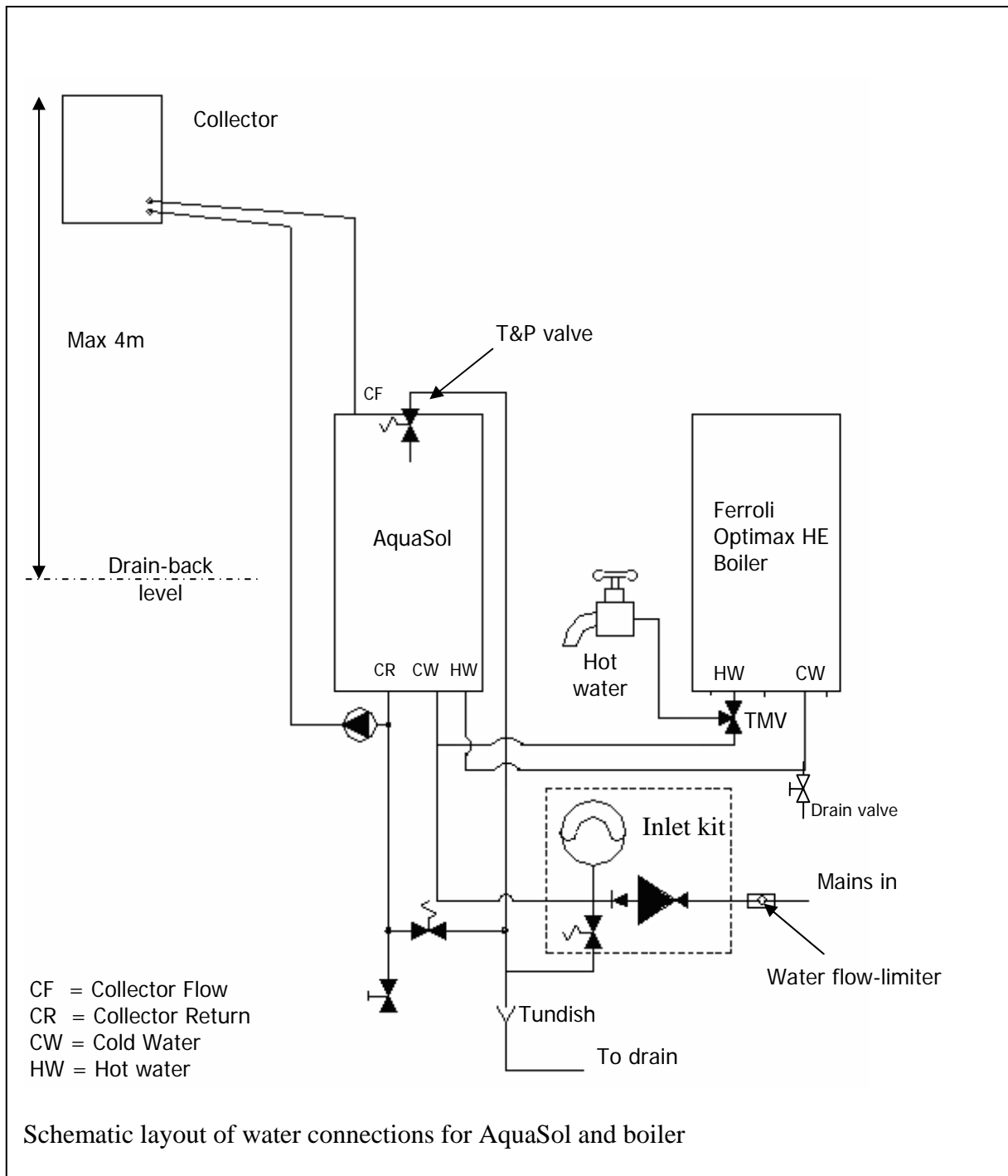
Once the position of the unit has been determined, the fixing points should be marked on to the wall at a minimum height of 1300mm from floor level, and at 325mm centres. Holes should be drilled at these points to accept the wall bolts directly or the supplied plugs, depending on the wall type. Fix the supplied mounting bracket using the wall bolts, and ensure the bracket is horizontal/level.

Note: if the AquaSol is not mounted on a solid wall, adequate precautions should be taken to ensure that the fixings are mounted into the battens of the wall and that these are of sufficient strength to support the unit.

Hang the unit on the wall bolts and secure with the provided nuts. Adjust the support leg to the correct height.

7. Installing the Unit

Installation of this unit should only be carried out by a 'registered installer'. That is an installer who has attended a course, or received instruction during their apprenticeship, on the installation of Unvented Hot Water Systems. All registered installers should carry an identification card as issued by the Institute of Unvented Hot Water Systems, the Construction Industry Training Board, or the Institute of Plumbers.



7.1 Before connecting this unit:

- For the installation of a complete Solar system planning permission may be required especially if the building is located in a conservation area or is a listed building. These solar thermal systems are classed as a 'permitted development'. It is however advised to check with the local planning department prior to installation.
- Ensure that incoming mains pressure is adequate: minimum 1.5 Bar, but less than 10 Bar. This information may be obtained from the local water authority, or by conducting a mains pressure & flow test.
- Excessive use of flux can damage this unit, especially the check valves. Avoid over-use, and ensure that the system and all pipe work is flushed to BS7593, thus removing all contaminants prior connecting to the AquaSol.
- Ensure that the discharge pipe (tundish) and drain valve are positioned away from any electrical components.

7.2 Assembling the Pump and filling manifold

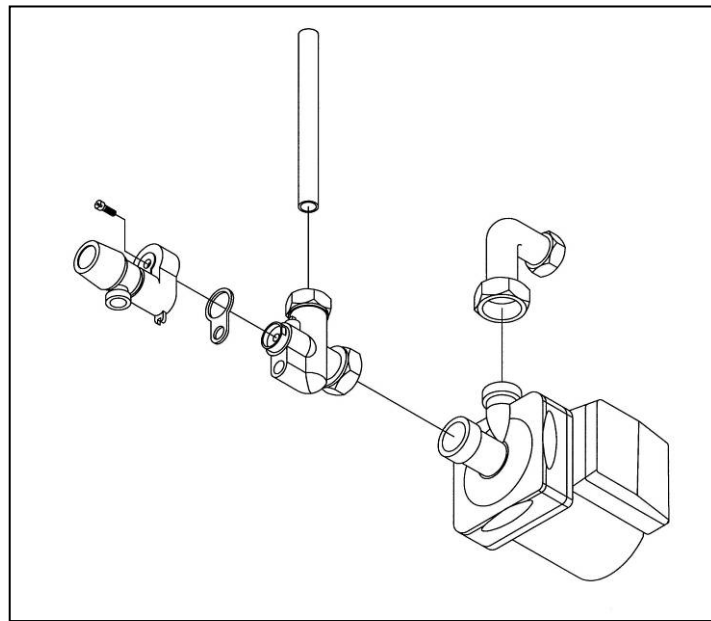


Figure 1

Assemble the pump and filling manifold as shown in Figure 1. Do not attach the expansion relief module at this time, as it is required to be detached for the system filling process.



Correct pump orientation

7.3 Assembling the unit

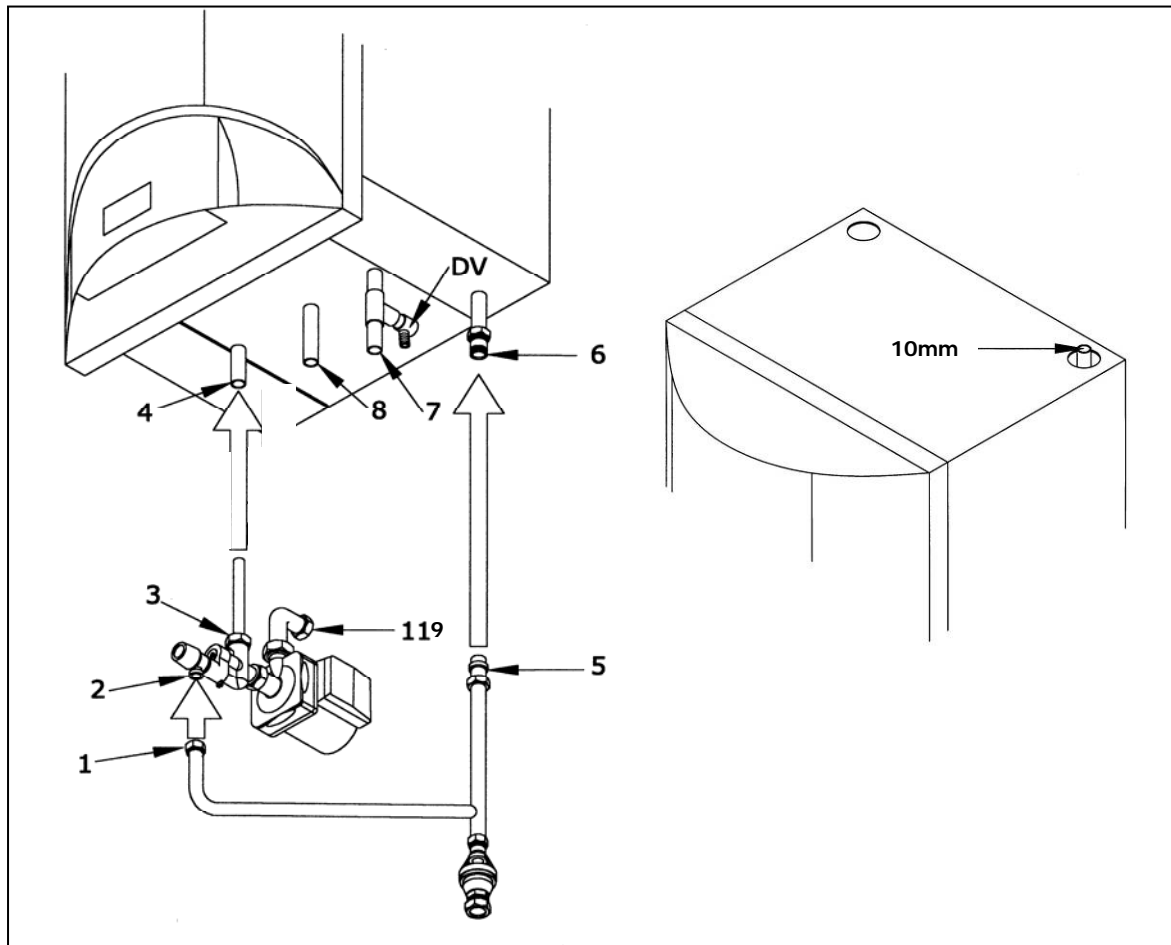


Figure 2

Connect the tundish assembly as follows:

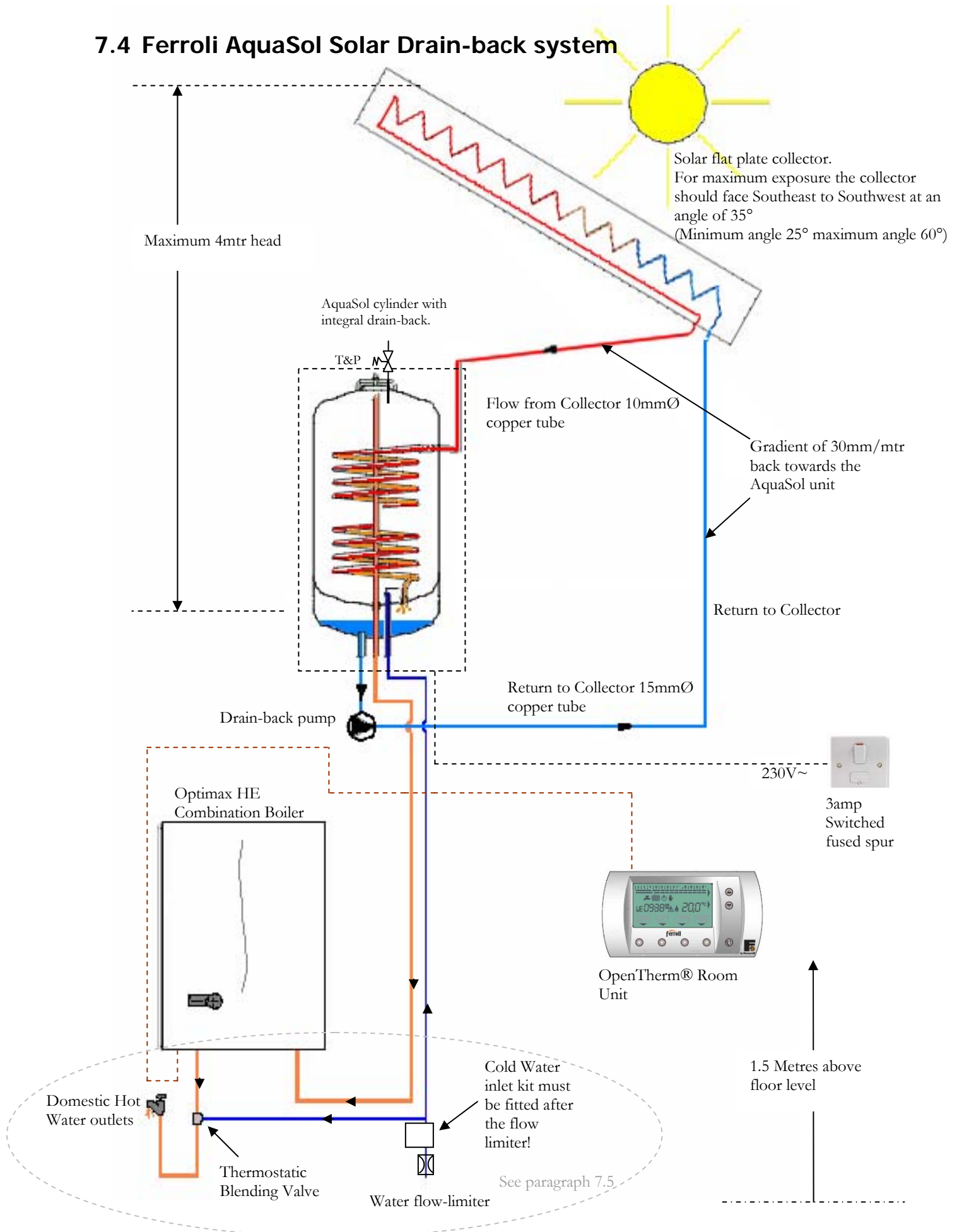
Connect (1) to the expansion relief valve on the filling manifold (2).

Connect (5) to the pressure relief outlet on the AquaSol (6), hand-tighten only.

Connect the pump assembly (3) to the collector return (4). Note that the 15mm copper pipe fits inside the 22mm stainless steel pipe. Hand-tighten only.

Ensure the pump assembly and main tundish tail are fully located, then fully tighten the compression joints.

7.4 Ferroli AquaSol Solar Drain-back system



7.5 Cold water inlet kit and Boiler connections:

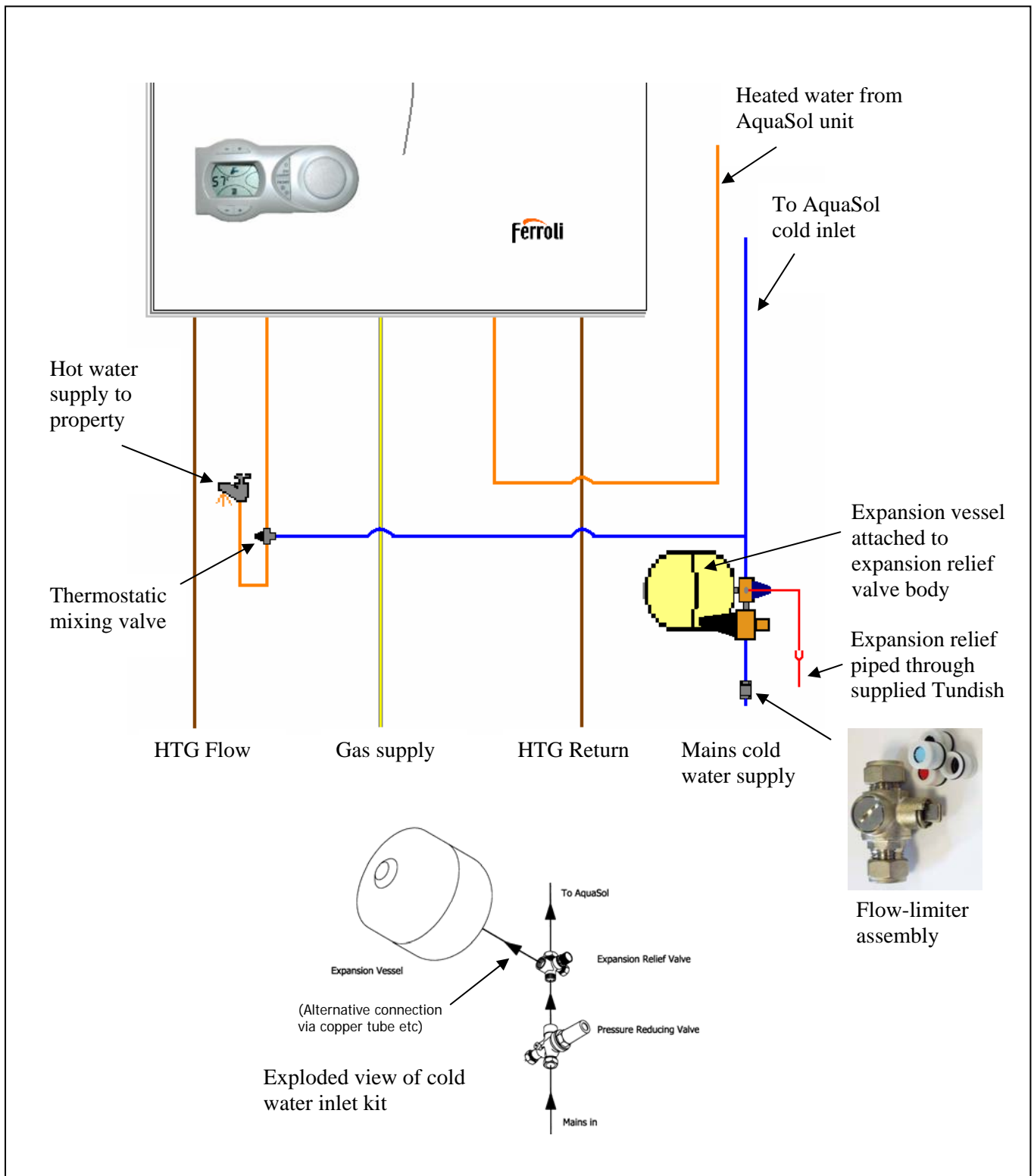


Fig a

It is not permitted to fit any valve between the expansion vessel and the expansion relief valve or the expansion vessel and the AquaSol unit.

7.6 To connect the unit:

The system should only be installed by a suitably qualified and registered installer.
Only compression fittings should be used to connect the unit.

Hot water

Connect the hot water outlet **HW**, to cold water inlet on the combination boiler. Connect the hot water outlet of the combination boiler to the supplied blending valve, which should be set to the recommended temperature of 48°C or as required, **NOTE** care must be taken to prevent scalding from too higher temperature.

Connect the safety discharge pipe from the tundish, to drain as stated in paragraph 7.9.

Solar circuit

Connect the solar return **SR with 15mm copper tube** (the pipe work running from the circulating pump outlet to the bottom of the solar collector).

Connect the collector-flow **CF with 10mm copper tube** (the pipe work running from top of the collector) to the top **CF** connection on the AquaSol.

NOTE: Both connections to the Ferroli solar collector are at the bottom of the unit and flow and return can not be mixed up. The flow connection is 10mm, the Return connection is 15mm.

Always keep in mind the drain-back level of the Solar storage system. Always install the collector in a level plain the flow & return must be mounted with an angle of **30mm/m or greater.**

The flexible connections of the collector must be installed with the same angle >30mm/m. The collector itself must be mounted level on the roof.

Install the collector as close to the AquaSol storage unit as possible to prevent extra heat loss.

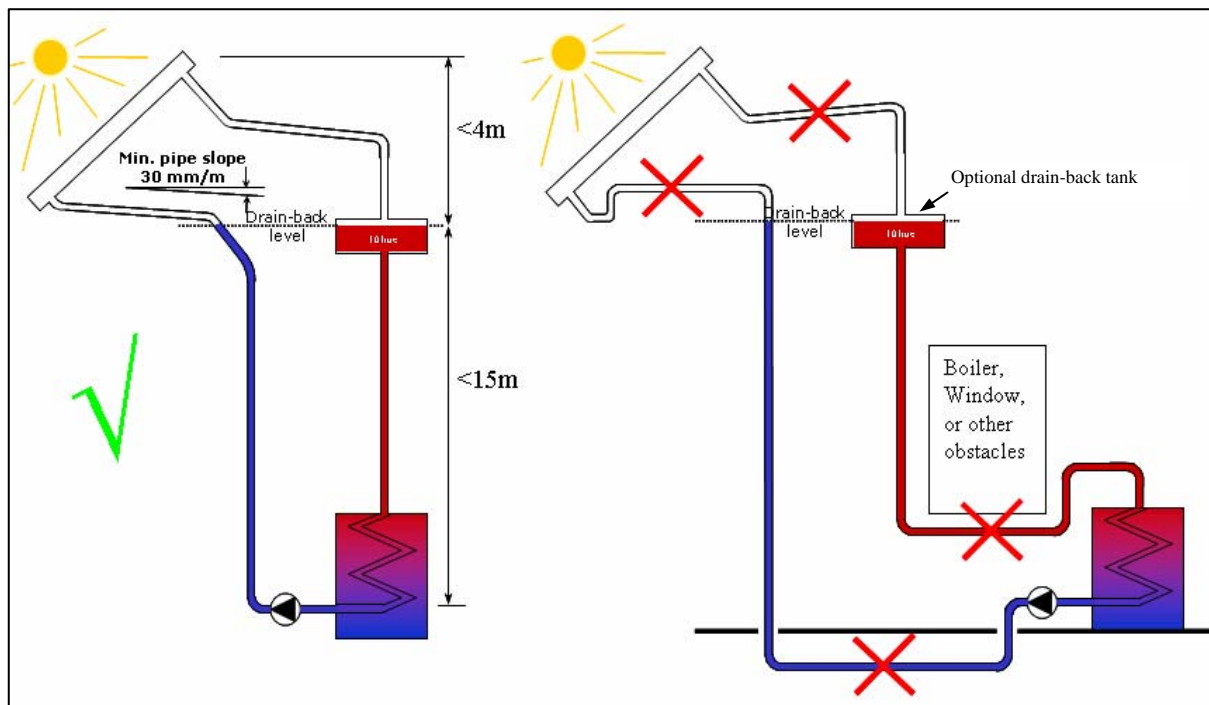
The maximum height between **drain-back level and top of the collector** is dependent upon the solar pump in the AquaSol storage unit. **Therefore the maximum height is 4m.** It is advised to install a separate drain-back tank in case this is more than 4m. See paragraph **7.7** and ask your supplier.

The manufacturer is not responsible for damage caused by not following the provided installation instructions or poor installation work.

7.7 High buildings -> optional drain-back tank

In high buildings (houses) where the difference between the AquaSol and the collector will be more than 4m a separate drain-back tank must be installed in the collector flow. In this way The maximum height difference between collector and AquaSol is expanded to $15\text{m} + 4\text{m} = 19\text{m}$.

For detailed installation instructions and filling procedure see also the Manual of the drain-back tank



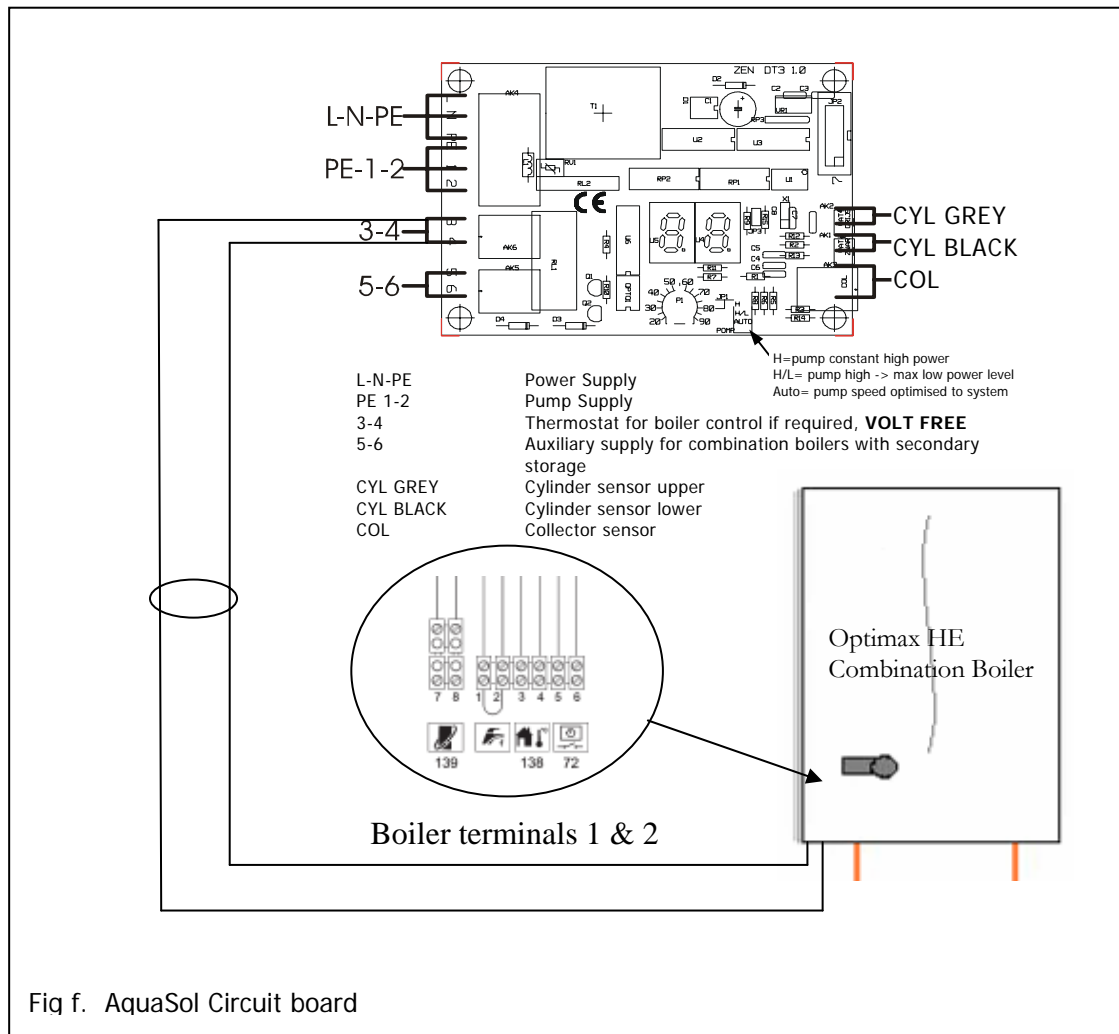
Installation of an extra drain-back tank in the flow of the collector circuit.

7.8 Electrical Connections:

The unit has a factory fitted cable. This cable should be connected to a 3 Amp switched fused spur.

The collector sensor must be connected to the terminals marked **COL**. Polarity is not important.

The AquaSol will give a signal to the Ferroli boiler to prevent it starting up the after heating function if the solar water temperature is above a temperature level of 60°C.



WARNING! Isolate the electrical mains supply before removing the outer cover!

7.9 Installing Discharge Pipes

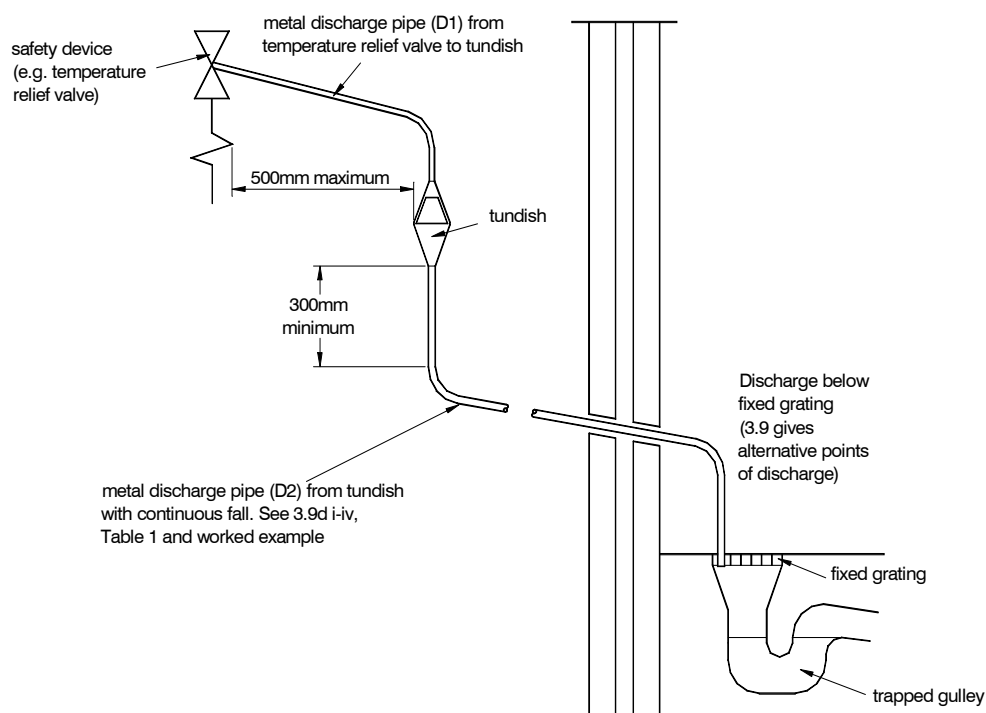
The discharge pipe from the tundish must be fitted and sized in accordance with Building Regulations for Discharge Pipes G3 (Clause 3.9, Diagram 1, and Table 1), as laid out below.

Clause 3.9 The discharge pipe from the tundish should terminate in a safe place where there is no risk to persons in the vicinity of the discharge, be of metal and:

- a. Be at least one pipe size larger than the nominal outlet size of the safety device, unless its total equivalent hydraulic resistance exceeds that of a straight pipe 9m long i.e. discharge pipes between 9m and 18m equivalent resistance length should be at least 2 sizes larger than the nominal outlet size of the safety device, between 18m and 27m at least 3 sizes larger, and so on. Bends must be taken into account in calculating the flow resistance. See Diagram 1 and Table 1.
- b. Have a vertical section of pipe at least 300mm long, below the tundish before any elbows or bends in the pipe work.
- c. Be installed with a continuous fall.
- d. Have discharges visible at both the tundish and the final point of discharge but where this is not possible or practically difficult there should be clear visibility at one or other of these locations. Examples of acceptance discharge arrangements are:
 - (i) Ideally below a fixed grating and above the water seal in a trapped gully.
 - (ii) Downward discharges at low level; i.e. up to 100mm above external surfaces such as car parks, hard standing, grassed areas etc. are discharges, a wire cage or similar guard must be positioned to prevent contact, whilst maintaining visibility.
 - (iii) Discharges at high level; e.g. into a metal hopper and metal down pipe with the end of the discharge pipe clearly visible (tundish visible or not) or onto a roof capable of withstanding high temperature discharges of water and 3m from any plastics guttering systems that would collect such discharges (tundish visible).
 - (iv) Where a single pipe serves a number of discharges, such as in blocks of flats, the number served should be limited to not more than 6 systems so that any installation can be traced reasonably easily. The single common discharge pipe should be at least one pipe size larger than the largest individual discharge pipe to be connected. If unvented hot water systems are installed where discharges from safety devices may not be apparent i.e. in dwellings occupied by blind, infirm, or disabled people, consideration should be given to the installation of an electronically operated device to warn when discharge takes place.

Note: The discharge will consist of scalding water and steam. Asphalt, roofing felt and non-metallic rainwater goods may be damaged by such discharges.

Diagram 1 Typical discharge pipe arrangement



Valve Outlet Size	Minimum size of Discharge pipe D1	Minimum size of discharge pipe D2 from tundish	Maximum resistance allowed, expressed as a length of straight pipe (i.e. no bends or elbows)	Resistance created by each elbow or bend
G $\frac{1}{2}$	15mm	22mm 28mm 35mm	Up to 9m Up to 18m Up to 27m	0.8m 1.0m 1.4m
G $\frac{3}{4}$	22mm	28mm 35mm 42mm	Up to 9m Up to 18m Up to 27m	1.0m 1.4m 1.7m
G1	28mm	35mm 42mm 54mm	Up to 9m Up to 18m Up to 27m	1.4m 1.7m 2.3m

Tabel 1 Sizing of copper discharge pipe D2 for common temperature relief valve outlet sizes.

Worked example:

The example below is for a G½ temperature relief valve with a discharge pipe (D2) having 4 No. elbows and length of 7m from the tundish to the point of discharge.

From Table 1 - Example 1
Maximum resistance allowed for a straight length of 22mm copper discharge pipe (D2) from G½ temperature relief valve is: 9.0m

Subtract the resistance for 4 No. 22mm elbows at 0.8m each = 3.2m

Therefore, the maximum permitted length equates to: 5.8m

5.8m is less than the actual length of 7m, therefore calculate the next largest size.

From Table 1 - Example 2
Maximum resistance allowed for a straight length of 28mm copper discharge pipe (D2) from G½ temperature relief valve is: 18.0m

Subtract the resistance for 4 No. 28mm elbows at 1.0m each = 4m

Therefore, the maximum permitted length equates to: 14m

As the actual length is 7m, a 28mm (D2) copper pipe will be satisfactory.

7.10 Advice on use in Hard Water Areas

When installing this unit in hard water areas we recommend fitting a scale reducer. This should be fitted on the cold water inlet, before the pressure-reducing valve.

7.11 Completing the Installer's label

The label giving installer's details, located on the side of the unit, **must** be completed by the installer in permanent ink.

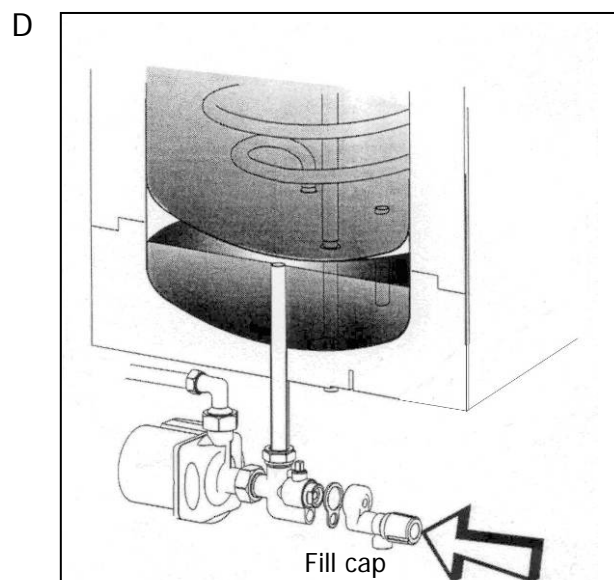
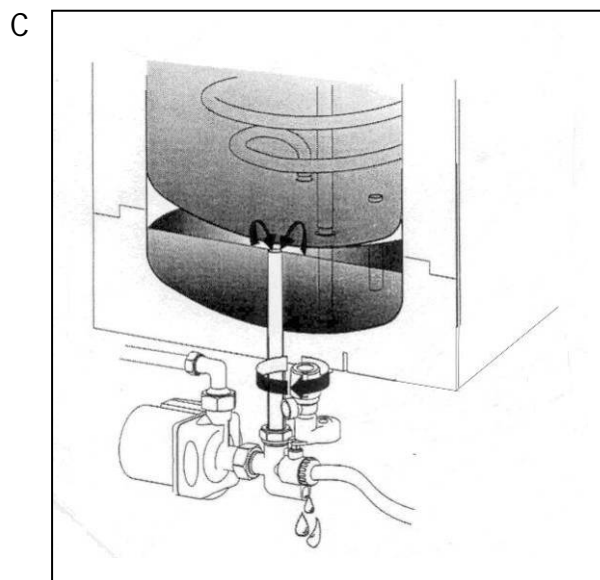
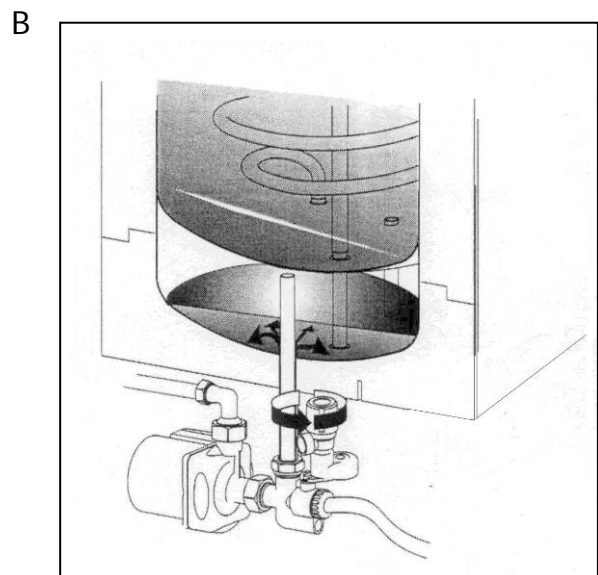
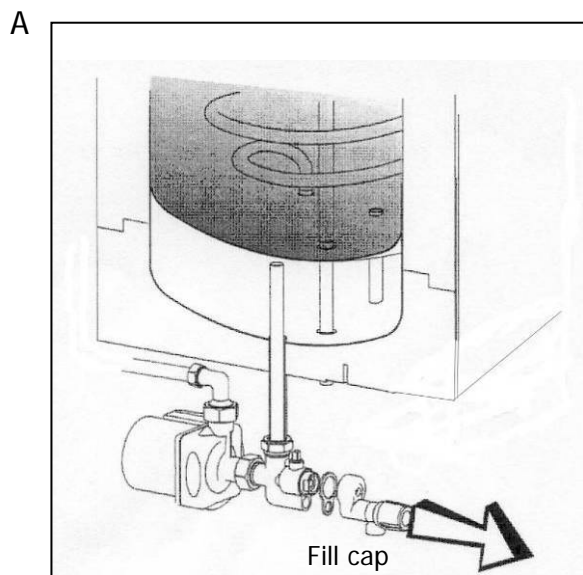
8. Commissioning the System and User information

8.1 Filling the Cylinder

Open a hot water tap, and then open the cold water inlet valve. Allow the cylinder to fill until through-flow is obtained at the hot water tap. Close the hot water tap. The cylinder is now filled. **N.B Flush system before filling.**

8.2 Filling the Solar Circuit

- A. Remove the expansion relief valve assembly by removing the M8 screw.
- B. Attach a clean water supply to the filler nozzle. Turn the valve on the filling manifold through 90°, and begin to fill the system.



- C. When water begins to flow from the fill level indicator at the bottom of the filling manifold, turn the fill valve back through 90° and detach the water source.
- D. Replace the expansion relief valve assembly and secure in place with the supplied screw.

8.3 Starting the System

To start the system switch on the electrical socket, the display on the front of the unit will light up. The pump will run for 20 seconds at high speed and 20 seconds at low speed. If there is sufficient solar gain the pump will continue to run, this is indicated by the lighting or pulsing of a small dot on the right of the display.

Normal operation

If solar radiation is available to heat up the AquaSol the pump will be switched on in high power mode during 400 sec. to purge air from the collector circuit. After this starting up period the pump flow will be adjusted depending on solar radiation and temperature in order to optimize the solar gain of the system.

8.4 System Failure

In an emergency situation this unit will shut down automatically due to the safety cut-out system (this can be identified by the unit display panel no longer being lit).

Hot water may also be discharged through the tundish. Should this situation arise, allow the unit to remain in this mode for a period of 2 hours, and then switch off, unplug the unit, and **contact the installer**.

9. Maintaining the System

9.1 Annual Maintenance

It is recommended that the following checks be carried out at least once a year by a competent operative:

- a) Twist the cap of the Expansion Relief Valve, and check that water is discharged, and is visible running through the tundish, and at the discharge drain. Ensure that the valve re-seats itself and that no further water is discharged.
- b) Lift the lever (or twist the cap, depending on model) of the Pressure /Temperature relief valve, and ensure that water is discharged, and is visible running through the tundish and at the drain. Ensure that the valve re-seats itself, and that no further water is discharged.

If any part fails these tests, shut down, drain the unit, and check for blockages. If these investigations prove negative, the part may need to be replaced. **Contact the manufacturer for replacement parts information or your local stockists.**

- c) Turn off the mains water supply, and remove the cartridge from the pressure reducing valve. Clean the strainer, and replace the cartridge. Turn the mains supply back on, ensuring there are no leaks.
- d) Remove the solar circuit **fill cap** and check that the water in the system is at the correct level, if not, top up the circuit as per paragraph **8.2**
- e) Check expansion vessel air pressure is at 3.5 bar, this should be checked with the mains pressure at zero.

- f) If the unit is installed in an area where the water is hard or contains appreciable solids, flush the system.
- g) Turn off the mains water supply, & drain down the hot water circuit by opening a hot water tap. Carefully loosen the union to the mixing valve as water may still be held within the pipe work! **WARNING** The draining of the system should only be carried out when the pipe work is cool as the water can become extremely hot during normal operation.
- h) Remove the unions from the mixing valve and clean out the filters as required. Check the operation of the check valves to ensure they open & close freely. Re-connect the unions & open the mains water inlet to ensure there are no leaks, close the hot water outlet.
- i) After the completion of the service it is advisable to check the temperature of the mixed water using a calibrated gauge, this should be done at the boilers recommended flow rate. (See the boiler technical data page within the boiler installation manual)

On completion of the annual maintenance, please complete the log at the back of this manual.

9.2 Draining the System

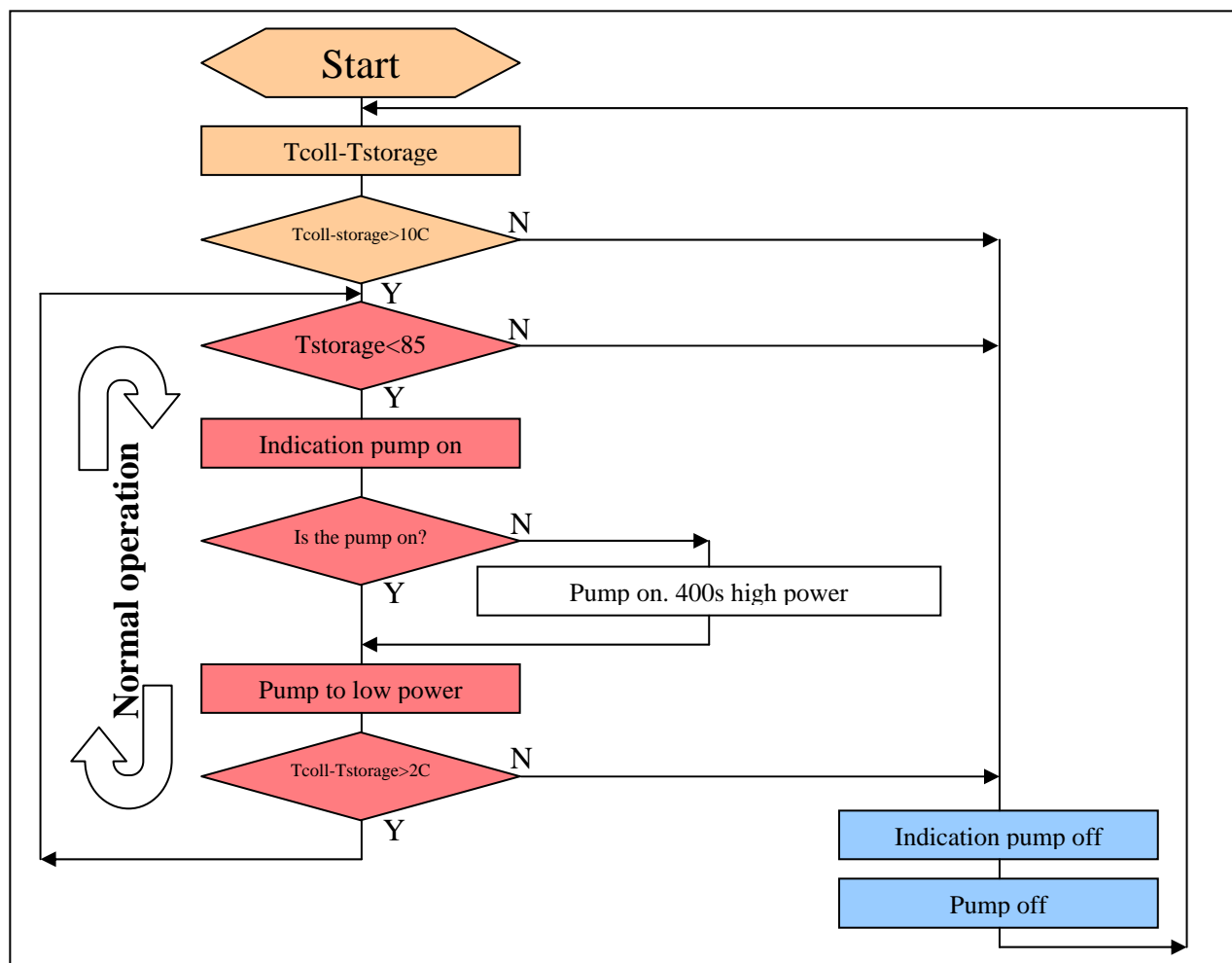
Isolate the 230v power to the unit. Turn off the cold water mains feed to the unit. Switch off the electrical supply to the combination boiler. Open a hot water tap, and then open a drain valve, which should be installed in the cold water inlet pipe at the lowest point.

9.3 Flushing the System

To flush the system, drain the system as per instructions **9.2**. Refill the system as per instructions **8.1**, This may be required several times if heavily contaminated.

10. Differential Temperature Controller

Optimum performance of the solar system is assured by the DT3 controller. The unit is fully automatic and will start the solar circulating pump when the solar collector is 10°C hotter than the lower part of the AquaSol cylinder.



When the temperature difference falls to 2°C the pump will switch off. Upon starting, the pump will automatically run on high speed (power consumption 80 watts) for a period of 400 seconds, following which it will switch to solar radiation dependent lower speed.

The pump will be switched off as the AquaSol reaches a temperature of 85°C. After this the collector circuit will drain and prevent the AquaSol from overheating.

10.1 Fault finding errors

In the event of a malfunction, flashing error codes will be displayed.

Codes 71 – 73 inclusive are **low** priority

Codes 74 – 77 inclusive are **high** priority

Error codes are automatically reset once the mains supply is isolated.

10.2 Low priority codes

Low priority codes are automatically deleted when the fault has been rectified. The system will automatically revert to normal operation after 10 seconds.

Code 71: Collector sensor malfunction

- a. temperature of the collector is below – 40°C or above 250°C
- b. sensor cable is broken or short circuited
- c. sensor defect

Go to **Tabel 2** - Check for faults in the Printed Circuit Board (PCB)

Code 72: Cylinder upper sensor malfunction

- a. temperature of the cylinder is below 0°C or above 100°C
- b. sensor cable is broken or short circuited
- c. sensor defect

Go to **Tabel 2** - Check for faults in the PCB

Code 73: Cylinder lower sensor malfunction

- a. temperature of the cylinder is below 0°C or above 100°C
- b. sensor cable is broken or short circuited
- c. sensor defect

Go to **Tabel 2** - Check for faults in the PCB

Sensor checklist (Resistance v Temperature)

°C	KΩ	°C	KΩ	°C	KΩ
0	32.150	35	6.530	70	1.750
5	26.310	40	5.330	75	1.480
10	19.860	45	4.370	80	1.260
15	15.890	50	3.600	90	920
20	12.490	55	2.990	95	790
25	10.000	60	2.490	100	680
30	8.060	65	2.090		

Tabel 2 Electrical resistance of the sensors

To Check For Faults In The Sensor / Cable and/or PCB

- a) remove the appropriate sensor from the PCB and
- b) temporarily fit a replacement and check the display against, for example, body heat
- c) measure the resistance of the sensor and compare with **Tabel 2** Electrical resistance of the sensors

10.3 High priority codes

High priority function codes are always shown before low priority codes. Removing a high priority code could show a low priority code afterwards if the mains supply is not isolated.

Code 74: No collector circulation

Code 74 results in a shut down of the pump for 10 hours after which the low speed revolutions of the pump are increased incrementally by 4% until after 6 days a maximum of 40% is reached. This is the normal operation of the DT3.

First check to see if the pump is already operating at 40% revolutions:

- a. Switch off the mains supply
- b. Put the jumper, JP1 on 'H/L' (paragraph 7.8)
- c. Switch on the mains supply
- d. The controller will now run for 30 minutes
- e. If after 30 minutes the controls function correctly and code 74 is not displayed, switch off the mains and put the jumper back on to 'AUTO'. The DT3 will automatically select the most appropriate low speed revolutions within the following 6 days

If after 30 minutes Code 74 appears again check the following:

- a. Check the operation of the lower cylinder sensor (**Tabel 2**)
- b. Check the height difference between the pump and the highest point of the collector (maximum 4.0m)
- c. Check the primary circuit for blockages
- d. Check the connections and operation of the pump

Code 75: Collector temperature too high (pump switched off by DT3)

- a. Collector temperature exceeded 130°C during the period the pump was operating
- b. After 10 hours the DT3 will allow the pump to run again
- c. Check the operation of the lower cylinder sensor (**Tabel 2**)
- d. Check the height difference between the pump and the highest point of the collector (maximum 4.0m)
- e. Check the primary circuit for blockages
- f. Check the connections and operation of the pump

Code 76: Pump does not switch off within 24 hours

- a. Check the operation of both collector and lower cylinder sensors (**Tabel 2**)
- b. Check the connections and operation of the pump

Code 77: Pump does not switch on within 30 days

- a. Check the operation of both collector and lower cylinder sensors (**Tabel 2**)
- b. Check that the collector sensor is in contact with the absorber plate

11. Service Log

Date	Serviced by <i>Sign & Print Name</i>	Remarks